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Application of HCMM data to regional geologic analysis for mineral and energy resource evaluation

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Type II Progress Report
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Prepared for
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by
Kenneth Watson, Principal Investigator
U.S. Geological Survey, Denver, Colorado 80225

Prepared by
Kenneth Watson and Susanne H. Miller
U.S. Geological Survey, Denver, Colorado 80225

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15. Supplementary Notes	

16. Abstract

The effects of topographic elevation and slope on thermal images were examined using representative field obstructions of the solar and sky radiation and a simple linearized thermal model. The forms are easily adapted for analysis of HCMM images using the DMA digital terrain data.

17. Key Words (Selected by Author(s))	18. Distribution Statement		
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Figure 2. Technical Report Standard Title Page

A. Problems

B. Accomplishments

A computer program has been developed to search a catalog of HCMM scenes in order to select appropriate day-night pairs for a given area. Options include automatic searching and graphical display of coverage with respect to a given area and the continental US outline. The catalog contains only those scenes with 20% cloudcover or less. (Also see significant results).

C. Significant Results

Sky and solar radiance are of major importance in determining the ground temperature. Knowledge of their behavior is a fundamental part of surface temperature models. These two fluxes vary with elevation and this variation produces temperature changes. Therefore, when using thermal-property differences to discriminate geologic materials, these flux variations with elevation need to be considered. From a representative set of field observations, it was found that flux variations with elevation can cause changes in the mean diurnal temperature gradient from -4^{o} to -14^{o}C per km evaluated at 2000 m. Changes in the temperature-difference gradient of 1^{o}-2^{o}C per km are also produced which is equivalent to an effective thermal-inertia gradient of 100 W $s^{1/2}$ m^{-2} K^{-1} per km. Thus, exposed bedrock on topographic ridges will appear to have a lower thermal inertia due to the additional effect.

A simple topographic slope correction has also been developed using a linearized thermal model and assuming slopes less than about twenty degrees. The correction can be used to analyze individual thermal images or composite products such as temperature difference or thermal inertia. Simple curves are provided for latitudes of 30 and 50 degrees. The form is easily adapted for analysis of HCMM (Heat Capacity Mapping Mission) images using the DMA (Defense Mapping Agency) digital terrain data.

D. Publications and Presentations

Hummer-Miller, Susanne, 1981, Estimation of surface temperature variations due to changes in sky and solar flux with elevation: Geophysical Research Letters, v 8, no. 6, p. 595-598.

Watson, Kenneth, 1981, Topographic slope correction for analysis of thermal infrared images, NTIS Report PB81 211781, p. 1-13.

E. Recommendations

F. Funds Expended

Total expenditures to date:

G. Data Utility

We have received CCTs for twelve scenes. Among them were four day-night registered pairs. The pairs included an east coast scene covering the Allegheny Plateau and Appalachian Mts. Two others were a 12 and a 36 hour pair of the west coast, covering Walker Lake and parts of the Cascades. The fourth pair covered the Overthrust Belt and, unfortunately, contained a significant amount of clouds.